DOCUMENT RESUME

ED 209 064 SE 029 674

TITLE	Program Evaluation: Project City Science. Executive Summary.
INSTITUTION	City Univ. of New York, Flushing, N.Y. Queens Coll.
SPONS AGENCY	National Science Foundation, Washington, D.C.
PUB DATE	31 Aug 79
CONTRACT	NSF-SER-77-26936
NOTE	72p.; For related documents, see SE 029 675-676. Contains light and broken type.
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	Curriculum Development; Educational Assessment; *Educational Research; Elementary Secondary Education; Inservice Teacher Education; *Junior High Schools; *Program Evaluation; Science Curriculum; *Science Education; Science Projects; Science Teachers; Secondary Education; *Secondary School Science; Summative Evaluation; *Teacher Improvement; Teacher Interns
IDENTIFIERS	Project City Science

ABSTRACT

Presented is the executive evaluation report of the Project City Science (PCS). The PCS, a program conducted by New York University and funded by NSF, sets as its major goal the improvement of junior high school science instruction in the inner-city environment. This report consists of five sections: (1) overview of the project; (2) operation of the project; (3) critical assessment - the overall project; (4) general conclusions; and (5) recommendations. The first section covers funding and project intent, and evaluation procedures. The second section covers staffing and organization, modification, and support for implementation. The third section covers funding implications, instructional methodology, university/school relationships, and effecting change. The fourth section presents general conclusions concerning the scope, status, planning, and legacy of the project. The fifth section offers two types of recommendations. (HM)

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PROGRAM EVALUATION:

PROJECT CITY SCIENCE

EXECUTIVE SUMMARY

ED209064

SUBMITTED TO THE NATIONAL SCIENCE FOUNDATION BY QUEENS COLLEGE

SE 009 674

AUGUST 31, 1979

FINAL REPORT: EXECUTIVE SUMMARY

PROJECT CITY SCIENCE

1979

Report submitted by
Queens College to the
National Science Foundation
August 31, 1979

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The material in this report is based upon work supported by the National Science Foundation under Contract No. SER 77-26936. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author and do not necessarily reflect the views of the National Science Foundation.

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ACKNOWLEDGEMENTS

The evaluation team would like to extend its sincere appreciation to the Project City Science staff. Their cooperation throughout the course of the evaluation has been extremely helpful. Under adverse conditions, and a heavy teaching schedule, the staff remained personable and responsive to the needs of the evaluators. Throughout the course of the evaluation, they suffered our presence with considerable patience and grace, retaining their candor and a balanced perspective even when what the evaluators had to say was not completely favorable. The staff was thoroughly cooperative and we are thankful for the courtesy that they extended to us.

We would also like to thank the Project Director, Dr. Fletcher Watson, whose competence and insight impressed us. His grasp of operational aspects of the Project was excellent, and his understanding of the Project staff's capabilities was quite detailed. He lent a measure of leadership and administrative ability which was extremely helpful to the Project during a difficult time. As evaluators, we appreciated his presence and the quality of his efforts on behalf of the Project.

We could not close without mentioning the contribution of the Associate Project Director, Dr. James Connor, whose willingness to give of his time seemed of immeasurable importance to the Project. Due to changes in leadership, his role at key junctures was critical, and his contribution throughout was significant. Much was asked of him, and he responded well. His efforts were respected by both the Project and evaluation staffs.

As was the case with the Project leadership, we found the rest of the staff to be congenial, able, and consistently courteous. We are most thankful for the way they received us. The major regret the evaluators had was the feeling that we may have been less helpful to Project staff in specific, individual ways than we could have been. Perhaps that was a fault in our definition of the role. Dr. Watson has offered a recommendation that is not unreasonable and which we feel merits serious consideration by future evaluative groups:

> I wish to make a suggestion which could reduce the communication gap between those inside and those outside. Why not station a member of the external evaluation team as a continual observer within the Project? Then there would be continuous feedback of information, and perhaps greater clarity of reporting on the actual operation of a project such as this. Such an agent on the scene could also raise in advance questions of interest to the external evaluators.

The evaluation team would also like to acknowledge a debt of gratitude to our advisory panel, without whose help and encouragement a difficult task would have become more than burdensome. The NSF, in its wisdom, suggested the formation of such a panel. Its members, Drs. J. Myron Atkin, Jerome Notkin, and Vincent Reed, have been exceptionally helpful, and we would strongly recommend the use of such a panel to other evaluators embarking upon a similar venture.

Last, we would like to thank the National Science Foundation for the freedom it offered us in pursuing the evaluation, and in reporting the events as we saw them.

I. OVERVIEW OF THE PROJECT

A. Funding Intent

During the early part of this decade, the policy of the National Science Foundation (NSF) had been expanding from an earlier emphasis on the development of teaching talent* to include attempts to support large-scale efforts aimed at influencing broad educational networks. This latter evolution can be traced in the Foundation's development of support for Comprehensive Programs, and, later, the Systems Awards, both of which stressed concern with issues that were more intricately interwoven within the deeper structures of education. The problems addressed were broader and solutions were aimed at the level of fully developed systems rather than at discreet individuals working within them.

The Foundation was also re-examining at this time the issues of impact and residue, i.e., how the projects supported were influencing the education of students, and which influences remained operative when funding was withdrawn. The re-examination led to the support of long-term efforts in which the Foundation committed itself to multiple year funding. Such an approach allowed recipients to design programs that were longitudinal in nature, and whose assessment could contribute in important ways to our knowledge of particular aspects of the educational effort. This approach represented a significant departure from the earlier practice of supporting non-product oriented interventions on a short term-basis, which had been the predominant mode.

In assessing these more broadly conceived, long-term proposals, support

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*An emphasis which manifested itself mainly in the form of summer and academic year institutes that provided training for in-service teachers.

was given to projects that focused on a specific need or problem within the larger educational system, and which offered a design for coordinating the efforts of relevant agencies and institutions concerned with the identified problem. In pursuing this policy, the Foundation was seeking to allow the directors of such projects a greater amount of discretion and flexibility. It was further hoped that these long-term commitments would result in decisions by local funding agencies to offer financial backing for project functions whose usefulness had been demonstrated during the time that NSF had supported them.

Project City Science (PCS) represented one such effort.* PCS appeared to be an important, and in many ways necessary venture on the part of NSF, to support a broadly conceived innovative educational venture in an urban environment. The concept was, for a number of reasons, an idea whose time had come. The nation was increasingly concerned with the social consequences of urban decay and dislocation. The writers of the original proposal put forward a sound analysis of the plight of the schools in the inner cities of the nation. The compelling need to learn more about the environments in which increasing numbers of our young people were being educated was clearly and skillfully developed. The Project had the focus that the Foundation was seeking and offered a means of coordinating the efforts of a number of agencies concerned with the problem.

Beyond specifying a particular environment (the inner city), the proposers of the Project went on to identify a specific level (the junior high school), and function (science) within the educational structure that clearly

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*The Project was proposed and conducted by members of the Department of Science at New York University.

required greater attention than they had heretofore been given.

The junior high school has long been an anomaly within the public school structure. Despite its status, all too little attention has been paid to the unique set of problems faced by educations at that level. The developers of PCS addressed these concerns with skill and imagination. They presented a perspective that provided a broad view of the problem, and recognized the need to specially train pre-service teachers for this environment. The proposal indicated an intent to offer additional aid to those currently in service, and to develop a school-university support system that would make available the best that each institution had to offer. It was a well conceived design, ambitious in scope, although perhaps overly optimistic in its stated and implied expectations. The design clearly encompassed major problems faced by educators at junior high school level, and offered the promise of dealing with them through a coordinated, inter-institutional effort, comprising research, teacher training, and implementation of innovative ideas.

Project City Science became one of several large scale, long-term programs supported by NSF. In supporting such projects, the Foundation appears to have had several sets of expectations--some more explicit than others. First, of course, was the hope of fulfilling the particular purposes for which each project had been designed. Second, and perhaps of lesser concern to the internal project management, was the Foundation's hope that the programs supported might not only accomplish their purposes, but do so in objectively measurable ways. A further hope was that a residual effect of such aid would be the willingness of local funding sources to assume the support of certain worthwhile project functions.

To aid in accomplishing these purposes, each of the projects, including PCS, was provided with an internal evaluation capability. In the case of

Project City Science, an external evaluation mechanism was also provided.* The ultimate purpose of the evaluation was to provide an outside perspective on what the Project had accomplished. This included an assessment of its outcomes during the funded phase, and an estimate of its continuing influence and prospects for the future. As stated in the Foundation's original charge to the evaluators:

> (The) third party evaluation is requested to provide a summative look at the funded period of the project from an external perspective. The evaluation should include a portrayal of the project indicating its strengths and weaknesses as determined by both the examination of existing data and the collection of new data. In addition, the study should provide insight on possible future directions for the project during the remaining ten years and aid NSF in making future policy decisions regarding projects of this type.[1]

B. Project Intent

As noted earlier, the submission of the PCS proposal coincided with, and was responsive to;

> a stated NSF interest (in) experiment(ing) with more flexible, more sharply focused and more fully coordinated approaches to staff development and support activities than was possible in other NSF programs, such as teacher institutes.[2]

The PCS proposal was based on a conscious decision by the leadership in the science education department at NYU to identify an area of need that was large enough to require their attention, and yet small enough to respond to efforts at improvements. It was decided that science at the junior high school level met these conditions. That it was an important area of need, few would dispute. The NYU staff also felt that as a project focus, it represented a problem of manageable proportions--one that was in their opinion sufficiently well defined

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*The PCS staff has noted that a fuller external evaluation was not provided until the fourth year of the Project's existence, which in their view was rather late to be of sufficient help.

to admit of possible solutions. That view was most clearly expressed by the Project staff in its response to an evaluation of Phase I (the first two years) of the PCS effort:

> We do not regard the gigantic City as our object of interest. We are interested in only a small but very important part of the City, namely the teachers and students in the intermediate science classrooms, and we do not regard these teachers and students as resistant foes to be overcome. The teachers are individuals who can change and become more effective if they are given help in clarifying goals, and provided with new insights concerning their students and their situations.[3]

As is clear from the response cited above, the Project staff had a reasonably clear picture of its major intent. It was one of revitalizing science teaching within the junior high schools of New York City. In the process, the staff hoped to discover and document some things that would be useful to educators in other urban areas. The immediate purpose was to develop two model districts within the New York City system that would reflect "the highest possible level of intermediate science teaching."[4] A more long range intent was to gradually fill a significant portion of the City's junior high school science teaching positions with PCS graduates who had been specially trained to work in the urban environment. Indeed, the Project leadership entertained the hope that:

> If Project City Science succeeds, and if it is duplicated in other cities, in ten years we could replace up to 40 percent (of junior high science staffs) with a cadre of science teachers trained for the job.[5]

In brief, these two statements epitomize the nature of the long and short range purposes to which the Project had committed itself. The Project staff believed that the junior high occupied a position of unique importance in shaping students' decisions to continue their education in science, since most of the courses offered in the high school are elective, rather than mandatory.

In working toward the accomplishment of the goals described above, the staff anticipated the achievement of four objectives:

1. The development of the two model school districts.
2. A unique pre-service training program at NYU.
3. A research and evaluation institute.
4. A strategy model for institutionalizing change.*

In explaining what PCS was attempting to accomplish, it is important to point out the difficulties the Project faced as it prepared to implement its design. The staff had already chosen perhaps the most difficult educational environment to work in--that of the inner city. The difficulty was further compounded by the fact that the Project was conducted in the most populous, and perhaps the most varied and complex, of the nation's cities. Beyond this, the staff had decided to work at a level within the school system, which while surely in need of aid, has been an enigma to many educators; the education of adolescents is still the most demanding and challenging task facing the schools. While acceptance of that challenge gave the Project added importance, it also posed a serious test of the skills and resourcefulness of the staff selected to implement the objectives. The vision and foresight of those who would hire the staff were to be put to the test, for the scope of the task assumed was audacious.

Within this complex geographical setting and demanding instructional level, two school districts were selected that themselves offered numerous challenges. Whether by design or through oversight, few concessions were made to the mounting list of difficulties with which the Project would have to deal. The apparent intent was to face, as completely as possible, the full set of burdens encountered by teachers working in this environment.

*This later evolved, or was replaced by, a program of dissemination.

During the second year of its existence, the Project was faced with a fiscal crisis in New York City that threatened to destroy much of what had previously been accomplished, and which thoroughly upset all plans for the future. There were massive lay-offs of instructional staff, indiscriminate reduction of support services, and wholesale reassignment of teachers with seniority to positions for which they were neither licensed nor trained. The Project staff, which had earlier attracted a number of younger innovative teachers to participate in their activities, suddenly found that most of those with whom they had been working were no longer employed. Compounding the problem was the fact that many of those who replaced them had little experience and even less training in teaching science. Much of what had been initiated needed to be reinstituted and most of what had been planned re-designed. It must be understood that the Project faced more than a simple change in personnel in the schools. The entire climate was altered. Teacher morale had been dealt a serious blow, and the PCS staff was working in an environment which was far less hospitable to the concept of school staff committing extra time and effort to the improvement of teaching. Even where attitudes remained more wholesome, energies were consumed by the more compelling demands of maintaining a badly shaken system of education. Few in such a climate were prepared to turn their attention to the implementation of innovative instructional techniques.

Finally, to the problems facing New York City must be added the economic difficulties which New York University itself was undergoing. The Project, designed during a growth period, was actually funded during a time when the University was experiencing some fiscal problems of its own. The result was a reduction of the total staff, thereby placing great restrictions upon the availability of supporting services. PCS, predicated upon a university-wide

support system, now found it more difficult to marshal the type of help once hoped for. The problem was exacerbated by the fact that the Department of Science Education was also experiencing shrinking enrollments. The crisis in New York City made the prospect of obtaining a teaching position appear poor,* and so student applications fell accordingly. Mounting economic restrictions seemed to settle upon the Project from every direction.

It is difficult for evaluators to render a judgment as to how damaging such a series of crises were to a fledgling project struggling to establish itself. It certainly seems reasonable to assume that they represented a serious blow to the enthusiasm and hopes of the staff. Providing leadership during such a time is difficult. The maintenance of the Project vision and of staff morale must have been particularly hard. There was considerable staff turnover during the early years of the Project. Some of this was planned, but not all. The loss of so many staff members, and particularly those who were mission-oriented, could well have taken the edge off their efforts. What is clear is that Project City Science was faced with a difficult set of additional burdens early in its history. The extent to which that inhibited Project achievement will never fully be known.

What has been described above is not offered as an apologia for the Project. The evaluators do not seek to imply that one was needed, nor would we attempt it. While there were problems, there were rich opportunities as well. What we have tried to do is to describe objectively, and in fairness to the PCS staff, the historical circumstances in which the Project found itself as it attempted to implement its design. We note that these events

*That this was never completely true for positions in science and mathematics was not clearly understood by many teaching candidates, although it was to become more readily apparent with each passing year.

took place prior to the evaluation period for which we are specifically responsible.* A number of the circumstances described were far less pressing during the time of the current evaluation, but we would not interpret our charge so narrowly as to preclude the possibility of their exerting a continuing influence. In pointing to them, we hope to provide a backdrop against which the Project's continuing activity might be examined and better understood. Where the constraint upon achievement is attributable to the general environment, it should be noted, as must be the failure of the Project staff to fully seize or capitalize upon the opportunities that their unique position afforded them.

C. Summary of Original Proposal

1. Funding

Project City Science was initially funded by NSF for a 34-month period, beginning in May, 1974, and terminating on March 31, 1977, though a subsequent proposal indicated that:

> the intention was for most of the funds to be expended over a two-year span ending August 31, 1976. The grant was made to underwrite the initial phase of what hopefully would become a three-phase, fifteen-year plan to greatly improve science teaching and learning in the large cities of America.[6]

In accordance with this plan, a second proposal was submitted by N.Y.U. requesting and receiving funding for an additional three years of operation that would constitute the second phase of the original design. Such funds were to insure continuation of the project from September of 1976 through the summer of 1979. Thus, the entire duration of outside funding was to extend over a total of five years, though there appeared to be some overlap in the funding

*This evaluation covers the second phase of the Project's operation, 1976-79.

provided for Phase I (1974-77) and Phase II (1976-1979).

Phase III of Project City Science was expected to continue for another ten years beyond this initial five-year funding period. This last phase was to be entirely self-supporting.[7] The PCS staff would use the funds initially provided to create the structure upon which the continuing operation of the program would be built. The intent was to make the PCS model a part of the permanent structure of New York University as well as to develop a strong base of support in the New York City schools and surrounding colleges and universities. The proposal* noted that at the end of these years of funding, Project functions and activities will be self-sustaining.

2. Project Intent

Project City Science represents an attempt to examine and deal with the problems of education in the urban setting. The proposal notes that while nearly seven out of every ten school children in the United States reside in metropolitan areas, the schools they attend too often reflect the limitations of the urban environment: persistent overcrowding, a rapid flux of ethnic population, a steadily increasing proportion of the very poor to be served, deteriorating physical facilities, and a shrinking financial base.[8] In the view of the proposal writers, one consequence of these limitations is that the quality of education in American cities has declined sharply and there is an urgent need to develop means of addressing the problems that have resulted.

PCS was designed to deal specifically with one dimension of that problem, science education, at a particular instructional level, the junior high school. The proposal states the major intent of the project as follows:

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*Unless otherwise specified, the proposal referred to will be the full proposal dated 12/1/75, which was initially submitted requesting funding for Phase II of the Project.

> 1) to put together a cooperative effort in New York City involving teachers in the city schools, the teachers' union, administrators at school, district, city and state levels, community organizations, professional associations, and several universities within the city, a coalition that can bring about over a fifteen year period a dramatic improvement in the teaching and learning of science in the intermediate schools (grades 6 through 9);
>
> 2) to do this in such a way that the reform process becomes continuous and institutionalized; and
>
> 3) at the same time, to generate and disseminate knowledge about adolescents, the learning of science in the inner city situation, and the process of improving science instruction.[9]

In a later section of the proposal, what is referred to as the central purpose of the project is restated from the original (1974) proposal:

> to help bring about a major, lasting and self-perpetuating improvement, principally in New York City, in the teaching of science in the middle grades between elementary and high school.[10]

While the rationale for placing primary emphasis on science rather than other subjects, such as reading or mathematics, is not clearly stated, it is evident that the proposers of PCS feel that science is an area in which instruction is particularly ineffective. It is noted that,

> science teaching at the middle school level in New York City and many other cities can only be regarded, on the whole, as gravely inadequate. . . (Further), science education in the city elementary schools remains woefully weak, when not absent altogether.[11]

Having concluded that, "improving elementary school science in the cities seems to be an intractible problem of massive proportions,"[12] Project staff apparently decided that the middle school (i.e., grades 6-9) should become the logical focus of their efforts. The reasons offered for this appear to be three-fold. First, a large fraction of inner city youth do not go on to attend high school, and so efforts made at a later stage would be too late. Second, by the time students reach high school, a deep antipathy toward the study of

science has already developed, and so they will usually not choose to take courses in science; third, even though many educators agree the junior high school years may be critical for students, very little emphasis has been placed on developing procedures that improve instruction or modernize curriculum at this level--particularly in science.

The proposal goes on to clearly emphasize its junior high school focus.

> For many city youngsters, junior high school provides the only formal instruction in science they receive in their lives!. . . it constitutes quantatively the most science they will formally encounter.[13]

Project emphasis was not solely upon the direct improvement of science instruction in the school, but upon the development of a model program for training junior high school science teachers as well. The intent was to both provide science teachers for the New York City middle schools, and to develop a training model with widespread potential. The then Project Director, interviewed for an article about PCS, indicated what the program's major concerns were:

> First, we're doing inservice training of teachers who are already in the schools. Second, we're designing a training program for the whole next generation of junior high school teachers. Third, we're working to analyze instructional problems and devise system-wide solutions. . . . Over the long run, (the Director) can envision Project City Science helping to effect a new kind of science teaching. . . . If Project City Science succeeds, and if it is duplicated in other cities, in ten years we could replace up to 40 percent with a cadre of science teachers trained for the job. . . . What we want to develop is a design that can be used in city schools throughout the country, something that can be adopted quickly by other universities and other school districts.[14]

3. Project Goals

Since the funding provided for Phase II of the project was substantially less than that originally requested, a revised proposal was submitted to NSF by New York University restating what was to be accomplished. The goals of

the Project had changed very little, though the revised proposal notes that,

> At the level of funding (provided). . . it will not be possible to accomplish (them) as rapidly as originally proposed or with the same probability of success.[15]

Nonetheless, the proposal clearly states that:

> The main purpose of Project City Science remains unchanged: to improve intermediate and junior high school teaching in New York City and to learn something in the process that will be useful to colleagues in other universities and in other urban areas . . . (Program cutbacks would be) undertaken using three criteria:
>
> 1) The Project's chief characteristics must be preserved. These include utilizing a cooperative and functionally comprehensive approach, keeping the school district as the chief unit of attention, being knowledge-generating and making and keeping long-term commitments. These features were to be regarded as more crucial than extensiveness and magnitude.
>
> 2) Those activities most likely to lend themselves to institutionalization should be favored. To insure continuing reform, this must be sought in the university, school, and community setting.
>
> 3) Whatever is to be undertaken must contribute to the development of a concrete, describable, visable entity or product that has dissemination capabilities.[16]

While the Phase I aspect of the project that was initially funded dealt with 16 separate areas, the revised proposal submitted for Phase II functionally reduced these to four areas in which a major effort would be concentrated:

> At the level of funding now available, the project will work toward the achievement of four definite "products." These are:
>
> 1) two model districts;
>
> 2) a unique pre-service program;
>
> 3) a research and evaluation institute;
>
> 4) a strategy model for change and institutionalization.[17]

The development of these four "products," then, is set forth as the major goal of the current phase of the program with which this evaluation is concerned.

The report will attempt to clarify the anticipated outcomes of each of the four major aspects of the PCS program and comments on the effectiveness of the effort the project staff has mounted to attain them.* In analyzing these efforts, it is useful to keep in mind the major problems that the proposers of Project City Science felt PCS was created to address.

> Assuming, then, that there is an especially urgent need to improve science instruction during the transition years, what are the particular problems that must be solved or at least ameliorated? The 1974 proposal explicitly claims, and Project experience has subsequently supported, that three major problems exist:
>
> 1) The failure of teacher training, both preservice and inservice, to prepare science teachers to deal effectively with the early adolescent child in the inner-city situation.
>
> 2) A continuing reliance on science programs that do not reflect sufficiently what has been learned in the last decade or so about science curricula and new approaches to teaching science.
>
> 3) A scarcity of systematic knowledge about the age group and about what conditions and techniques best promote an interest in a learning of science at that age and in inner-city circumstances.
>
> Implicit in the proposal and accentuated by Project experience is a fourth problem: The failure on all sides to identify, organize, and bring to bear in a coordinated way the not inconsiderable material and human resources of the state, city, district schools, universities, and community at large. Related to this is the problem of establishing a self-sustaining system for continuing reform rather than merely instituting this or that improvement, regardless of how alluring a given reform seems to be in the short run, or however much desired by one or the other agency or institutions.[18]

As clearly demonstrated by the text cited above, the four components of the Project were created as a means of responding to the problem areas defined.

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*For a clear and brief definition of the goals of each of these four areas of the program, the reader is referred to Appendix O, which is taken from the revised proposal submitted by New York University to the National Science Foundation.

Those problems center around the need for improved teacher training, better instructional practices, a more informed research effort, and an improvement in the way resources are brought to bear on difficulties that have been defined. As will be evident throughout, the evaluators feel the most equitable practice in stating Project objectives and clarifying intent, is to allow the documentation to speak for itself. Summarizing the overall purpose of Project City Science, the following excerpt from Progress Report #11 seems to offer the most concise explanation of both the immediate and long-term purposes of the program.

> As stated in the Project City Science revised proposal for refunding, the Project is committed to the establishment of four products: two model districts, a unique Preservice Program, a research institute for the study of inner-city science, and a well-articulated model for change and institutionalization. Furthermore, activities undertaken which fall under each of these rubrics would be ones which lend themselves to visible entities with dissemination capabilities. Clearly, from its inception the Project has had a wide scope in mind, with the hope of having its model for educational reform adopted by other major universities and their neighboring school systems throughout the nation. Indeed, this notion is contained in the phrase, mission-oriented Project. To accomplish this broad goal calls for communication with university researchers and administrators and the administrative and teaching personnel of school systems.[19]

The proposers of the Project set very important goals for the program. The Project had high expectations for what it could accomplish in its immediate environment--the schools of New York City. Beyond that, the hope was to establish models and assemble data that would be of interest and use to the broader community of science educators.

As noted earlier, the PCS Project Director believed that the program could help "effect a new kind of science teaching." Each of the four major components of the program were intended to meet not only local, but broad,

long-term goals. A CBTE document filed with the State of New York described the preservice program as follows:

> The preservice Intermediate School Teaching Program is taking form, acquiring character and before long should have established itself nationally as the highest quality program of its kind.[20]

Similarly high expectations were held for each of the remaining major components of the programs.

Dissemination:

> We're disseminating what we learn. Eventually we'll have a national network of city school systems that have access to what we've developed and we'll have documentation for them to go to.[21]

Model Districts:

> We propose to have within three years two school districts operating in such a way as to stand as visable, visitable examples of what can be attained even in the face of inner city economic and political problems.[22]

Research:

> A comprehensive research program to analyze instructional problems and offer broad solutions (is part of the program). The intent is to design a lasting mechanism that will begin to make headway in generating systematic knowledge about the science learning of early adolescents in the inner city situation and also about how to achieve science teaching in the inner city schools.[23]

The task the Project sought to undertake was a serious and difficult one. The goals set were broad in scope and often quite complex in dimension.* Even following two years of experience and facing a reduced budget, the Project leadership appeared to feel the accomplishment of the major goals originally set for PCS remained within reach.

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* Appendix P offers the full set of Project goals and a list of attendant activities related to these goals, drawn from the proposal submitted by PCS to implement Phase II.

D. Evaluation Plan and Procedures

The assessment of Project City Science addressed itself to the major priority of the program, the effort to improve science instruction in the urban intermediate school environment. The evaluation followed a "responsive" approach pioneered by Stake and others at the University of Illinois. In a responsive evaluation, considerable emphasis is placed upon close observation of the program being conducted and continuous interaction with Project staff and others participating in its functions or served by them. Primary attention is given to the activities and communications of the project, identification of major issues related to these activities, and the collection of relevant data upon which judgments can be based.[24]

To accomplish these purposes, the evaluators employed a design composed of four basic elements: A program of regularly planned observations, a series of interviews conducted with key participants, the collection of questionnaire and survey data, and thorough review of Project documentation. Once the design had been developed, an advisory panel was formed to offer the evaluation team an outside perspective. The advisory panel consisted of Drs. J. Myron Atkin, Jerome Notkin, and Vincent Reed. They provided the evaluators with expertise in the areas of program assessment, science education, and school administration. Members of the panel visited PCS field-sites, observed and interacted with Project staff at NYU, and consulted with the evaluation team at regular intervals.

The program of planned observations constituted an element of major importance in the conduct of the evaluation. It included regular visits to classes conducted for pre-service interns at the University, monitoring PCS staff meetings and also attending meetings of interns and smaller groups of Project staff. Evaluation team members were also in attendance at several

conferences where Project personnel discussed activities or presented papers. Observations were also conducted at all Project field sites on a regular basis. Observation visits were not confined to members of the evaluation team. A balanced set of visits by science educators working at the college level, science supervisors from the public schools, and classroom science teachers was also arranged. Observation protocols containing evaluative comments or written reports were requested of all observers.* Observations were conducted throughout the course of the evaluation and observers were sent to both University and public school classrooms. Some videotaping of instruction in the schools was also conducted.

An equally extensive effort was made to continuously interview those connected with the project. Interviews were conducted with all Project staff, interns, and school personnel over a two-year period. Both structured and informal interview procedures were employed. A number of interviews were taped to allow a more accurate and reflective appraisal of views expressed. In addition to those immediately involved in the Project, interviews were conducted with New York University officials, members of the United Federation of Teachers, PCS advisory panel members, NSF officials, and various school district and Board of Education personnel.

Questionnaire and survey data was collected from pre-service interns, on-site coordinators, teachers and administrators in the public school, PCS Advisory Board members, metropolitan New York and other selected colleges, recipients of Project publications, former PCS staff members, interns who had dropped out of the program, and all recent and former Project graduates.

A case study was also conducted of the PCS involvement in another school

*Appendices F-H represent a summary of these reports.

district during its initial two years of operation. The bulk of the data referred to above is presented in Appendix Q of the full report.

The last major element of the evaluation consisted of an ongoing assessment of all Project communications. This effort focused heavily upon Project publications, particularly the Progress Reports, but also included the original and revised proposals for funding, Advisory Board minutes, internal correspondence, course outlines, papers presented at conferences, communications to staff and school officials, agenda for staff meetings, and a variety of external correspondence dealing with Project concerns.

The data collected from all these sources was presented and discussed at evaluation team meetings. The results formed the basis for planning successive stages of the evaluation. In terms of the view which are offered, the evaluators make no claim to infallibility. We can only state that we have attempted to insure that the important observations we offer are well-supported. We believe they represent an accurate picture of the Project but understand that others, including the PCS staff, will find points of disagreement. As we have noted, the methodology which was employed placed a heavy emphasis upon the collection of observation, interview, and survey data. The conclusions we have reached have been extrapolated from such data with care exercised to be sure that they were confirmed by more than one source. It is our sincere hope that what has been assembled will prove of some use to the Project staff and others interested in making similar efforts.

II. OPERATION OF THE PROJECT

A. Staffing and Organization

As we have noted earlier, the accomplishments of the Project have been limited by the size of the staff that was available. The problem this posed was not confined to staff size alone. That is, it moved beyond the sheer limitations of numbers to present further complications in regard to the variety of talents and skills that were available. In a project that was working in as complex and demanding an environment as this one, there was a constant need for a diversity of insight and understanding that was necessarily limited in so small a faculty. Given the ambitious intent of the program, it seemed that the scope of the talents needed was always broader than that which was available.

To point to such limitations is not to offer an implied criticism of the professional ability of the staff that was employed. Admittedly, the ambitious goals of the Project did place a premium upon the intelligent hiring of staff and a careful match-up of their skills to the tasks that needed to be performed. That issue should not be avoided and will be addressed in a later section. What is alluded to here is the simple lack of human resources and the restrictions this posed for a project with such a diverse set of expectations. The Project had available to it the equivalent of three full-time faculty positions. In attempting to meet the many demands upon them, these positions were at various times spread out over as few as six and as many as nine part-time faculty members. While that met the need to expand the set of skills available, it left each member of the staff with other sets of responsibilities that required their attention.

Faculty members working on the Project were to be released from an equivalent portion of their normal responsibilities. It is not easy to determine

precisely the set of responsibilities of which Project staff was relieved. The number of faculty in the Department of Science Education had been decreasing for several years. Because of this, it is hard to determine how many persons were needed to conduct the normal business of the department, aside from the concerns of the Project. The separation between the Project and the department was not clear. In certain ways this was intended and necessary. To accomplish the intent of institutionalization, the lack of separation was good, but in practice it meant that the remaining staff had to conduct all the ongoing business of the department as well as that of the Project. The organizational strain was obvious and was noted by PCS staff. It frequently appeared that PCS was added on to the normal set of departmental responsibilities, with key staff members assuming heavier loads to accommodate the needs of the Project rather than being relieved of other tasks.

Because of the lack of sufficient resources, there was a considerable premium on skillful organization, administrative leadership, and inter-departmental cooperation. In the opinion of a number of the former and some of the present staff members, these important conditions were not always satisfactorily met (See Appendix J). Much of the inter-departmental effort that was planned never came about. A portion of this was due to conditions at the University, discussed earlier. This, however, cannot account for the almost complete lack of cooperation from other departments. Certainly, a part of the lack was also due to the barriers to cooperation which normally exist between departments. A certain resistance to such efforts, particularly when they are under the aegis of a single unit, could have been anticipated. A reasonable plan or design for dealing with such territoriality was necessary, but apparently did not exist. That represented a failure of foresight on the part of leadership, thereby denying the staff some much needed help.

The Project was also handicapped by changes in administrative leadership. The influence of such changes cannot be fully evaluated, and it would be wrong to attribute more to them than is reasonable. Nonetheless, such changes at important junctures can and do have important consequences. The actual shift in leadership often is preceded by a period in which the impending change is anticipated, and the complete attention of neither the incumbent nor the incoming leadership is fully available. That can be disruptive, as can the normal change in leadership style and emphasis. In the case of PCS, the staff operated for a year with a Project Director who was present only two days a week. Thus, to the complication of a change in leadership was added the need for a certain division of administrative responsibility. That too provided some difficulty. Beyond this, since the Project was predicated upon an evolving definition of roles, it may not have been prepared organizationally to handle the types of problems it encountered.

After the New York City crisis (and perhaps again after the change in leadership), there appeared a need to reorganize, find new resources, and use the staff in different ways. That this was not done seems, in retrospect, unfortunate. Surely the climate in and around the Project at that time had changed drastically. It was no longer clear that the original goals remained within reach, but it seems certain that they were not attainable in the same way or to the same degree that had initially been planned. That an extensive reassessment of purpose was not conducted should not be overstated as a fault. Considering the extent of the crisis, one could reasonably conclude that the PCS staff responded well enough to have survived and remain a viable force after is was over. Still the choice was possible.

For the benefit of those attempting future efforts of this type, it may be useful to consider what alternatives were available under the circumstances.

It would seem that the best counsel that might be offered a project staff facing changes as extensive as those which confronted PCS would be a recommendation to consider a thorough reorganization. This would include a complete re-examination of purposes and of the structures that had been created to accomplish them. It simply does not seem appropriate to continue applying a construct which had been created during one period to another period for which it may no longer be appropriate. It could be that the superior course of action in such an instance would consist of simply marking time while reassessing what is possible.

We believe that such a course of action would have benefited Project City Science. It is not that the failure to employ it emptied the Project of purpose or direction. The staff continued to do useful things. There is a real possibility, however, that allowing the staff to remain fully engaged throughout the crisis was a mistake. PCS offered the schools a welcome service but at the possible expense of denying its own staff the time they needed to consider how to redirect their own efforts. A temporary halt might have allowed the PCS staff to react better to the changed circumstances and to even find means of capitalizing upon some of the unique opportunities these changes may have provided.

We noted earlier our concern about the Project staff's tendency to set goals at such an unreachable level that the practical operation of the program was conducted without real reference to them. The Project appeared to move increasingly into an informal mode where the relationship between behavior and purpose was not always clearly charted. The crisis described would appear to have reinforced that tendency. A temporary halt would have provided one means of rectifying the problem, allowing the staff to plan a better fit between what was intended and what now remained possible.

B. Modifications

In an earlier evaluation (see Appendix A), we noted a modification of the Project in which the formal model for institutionalization and change was apparently deemphasized and the dissemination effort expanded to replace it.* The shift in emphasis may have been dictated by a number of changes in the climate of the Project at that time, though there is little record of conscious planning. At that same time, however, the Project faced another set of circumstances which did seem to demand that important modifications be made. Having shaped its design and submitted an accompanying budget for the conduct of Phase II of its effort, the PCS staff found itself confronted with a fifty percent reduction in the funding that had been sought. One would have expected an adjustment in some of the broad aims of the Project which would have corresponded to the new set of realities dictated by so severe a cut. In our opinion, this did not happen.

The Project staff sought to make its adjustment mainly in one dimension, that of reducing the number of school districts with which they proposed to work. The revised proposal sent to NSF noted the need to "reduce staff and to eliminate or cut back certain activities." It goes on to indicate, however, that the major modification would be to substitute "intensity for extension," explaining that Project staff would work in two school districts rather than the four that had been originally proposed. What they did not attempt was to reassess the broad ambitions of the Project and whether or not they could still be accomplished. That decision seems crucial. In retrospect, it appears that the Project staff did not give sufficient thought to how the budget cuts

*As will be shown in a later section, the change model was not completely abandoned. Attempts to formally apply it were discontinued but some elements of the initial effort still remained.

would affect their ability to perform a number of the difficult tasks to which they had committed themselves.* The reduction was drastic. The analysis of what was now possible needed to be conducted at a level proportionate to those reductions. It was necessary to determine whether the cuts were such that they would influence not only the number of locations but the actual scope of the problems the Project could address.

It surely seems that the influence the cuts would have on the central purposes of the Project was underestimated. This may have had results that continued to seriously hamper the effectiveness with which a number of Project activities could be conducted. One example of this, previously referred to, was the impact of reductions in the total number of staff anticipated in the initial planning. Such reductions had an expanding influence on the whole operation of the Project. That influence had to intensify when initial objectives were not satisfactorily adjusted.

As one begins to circumscribe the number of staff who will be available, it becomes clear that what is lost amounts to something more than mere faculty positions. There is a decrease in the scope of the interaction that is possible, the diversity of ideas exchanged, and the capacity of the staff to excite each other's interest and inspire fresh activity. In brief, the budget restriction posed more than a simple case of reducing the services that could be offered. The inner vision of the Project was itself affected.

It seems that two possible modifications would have been entertained at this point. One would have been a reconsideration of earlier objectives. That

*What was at issue was not only whether such tasks could be accomplished but the quality with which they would be performed. Many remained within reach, but not at the same level of performance.

would involve a reordering of overall aims and not simply the working environments. A second consideration would have been the launching of a concerted effort aimed at making up for the loss of faculty. This would have included contacting other sources of help within the University to find constructive ways to fill anticipated gaps in the Project created by reduced funding. Thus, one of two alternatives would have been expected: Either a restriction of the original scope of the Project, or efforts to find alternative means of performing functions that would otherwise be detrimentally affected. Efforts at adjustment were made, but not at a level consistent with the budget restrictions that had been imposed. It seems that the Project staff simply miscalculated its own needs by assuming they could attempt what had originally been intended even when faced with such a grievous reduction in funding.*

C. Support for Implementation

In initiating a discussion of this type, the evaluators feel compelled to emphasize the intense difficulty faced by a project working actively in the schools. Much of what takes place in education conspires against such risk-taking. Funded programs, operating in that same milieu, are far from exempt. It is easy to fail when there are so many elements over which no real control can be exerted. The broader the influence that is sought, the greater the risk. It becomes increasingly simple to have important things go wrong. The possibilities for interpersonal disharmony are greatly multiplied when one considers the variable of inter-institutional cooperation. Conflict can erupt both within and between staffs. Inexperienced interns or faculty can use bad judgment that reduces or hinders Project acceptance. The prospects for

*The PCS staff has referred to the need to achieve a "critical mass" in reference to its research effort. The term is lacking in specific meaning but the idea it attempts to convey is applicable in regard to the pool of faculty talent that projects such as this require.

failures are numerous.

At the interpersonal level, this Project has handled its relationships with the schools quite well. The districts in which they are currently working want them to return. Their efforts are generally respected and their relationships remain positive. This is no small accomplishment, and it has left the Project in a position where it can continue to work with and influence instruction in the schools.

In managing its field relationships as well as it has, the Project staff has not had a great deal of external support. As pointed out earlier, some portion of this may be their own fault in not overcoming the inertia and resistance of other departments at NYU. The University leadership, however, has not been of great aid in this endeavor. As at other universities, much is offered in the way of verbal support. University administration expresses the desire to see its staff involved in the community and offering aid. The individual reward structure for faculty and the broad university support systems, however, say otherwise.* From the level of Dean on downward, there appears to have been insufficient appreciation of what was done, or support for what was being attempted. While prepared to acknowledge the Project's importance, little in the way of either material or moral support was offered. Despite the rather clear nature of the need for University support implicit in the proposal, the Project appeared to be very much on its own. Not even its success in managing its field relationships so skillfully seemed appreciated or much valued. In many ways, the University leadership seemed unaware of the opportunity that PCS represented. That opportunity, in our opinion, went well beyond the

*The University continues to apply a one-dimensional reward system that honors publication as the sole activity meriting either tenure or promotion. Right or wrong, such a system mitigates against extensive efforts of this type.

confines of science eduation. It included a broad potential for working in the schools and with other community agencies. In any event, less seemed offered in the way of support than would have been expected. Outside of what was funded, little was provided. It is difficult to see what the University contributed to the Project's efforts to accomplish its major objectives. In that respect, it seems that University leadership was far better served by what Project City Science offered them than by what they offered in return.

III. CRITICAL ASSESSMENT: THE OVERALL PROJECT

A. Funding Implications

The evaluation team has stated at several points its belief in the usefulness of this Project. It would seem appropriate to clarify and expand upon that belief, particularly in the light of some of the criticisms that have been offered. PCS constitutes an important effort. On a broad level, it represents an attempt on the part of the funding agency to determine the efficacy of concentrating resources, focusing upon the support of large-scale efforts rather than a series of smaller ones. The final estimate of such an outcome will take some years to determine. It is unclear at this point whether this Project will continue, or if it does, precisely what form it will take. Time alone will allow a determination of the Project's long-range success in finding its own sources of funding and establishing its importance as a voice for science education.

One can, even at this juncture, however, offer some estimate of the reasonableness of such a funding approach. The evaluators, from their present vantage point (and we admit there are important limitations to what we can now see), believe that the experience of this Project raises some important questions which need to be considered when funding major endeavors such as this. On the one hand, the value of supporting projects with the broad capability of a PCS is recognized. That support allowed things to be attempted that thirty smaller projects could not have done. On the other hand, the PCS effort has given reason to believe that such large-scale attempts often bring with them problems that are not easy to overcome. For example, when one launches an effort of this magnitude, it seems that it almost inevitably results in the creation of a complex or sophisticated model. Such models are, by their very nature, often at variance with the systems into which their proposers seek to

have them introduced. They are also efforts whose actual functioning often depends upon a partnership, but which have usually been exclusively conceived and developed by only one of the partners, the university. As noted in our earlier evaluation (see Appendix A), the inherent inequality of such partnerships frequently results in inter-institutional working arrangements that frustrate attempts at making permanent change. These twin dangers seem general, and future funding should be predicated upon a clear demonstration that they have been considered and that compensation has been made for their disruptive potential.

As is obvious, an organization such as NSF must make a number of important decisions about how funds should be allocated. Discoveries about the limitations of a particular type of funding in no way indicate a failure. Such efforts allow important understandings to be reached and, thus, irrespective of results at the operational level, something of value will be learned from projects such as this.

In regard to the funding of programs with broad intent, we believe the potential limitations we have noted above are serious and require attention. While we fully support what has been attempted through the PCS venture, believing it an effort that should have been made, we are not at all convinced that we would recommend that other such efforts be funded without assurance that some of the related problems have been confronted and dealt with.

Project City Science is important at a number of other levels and these also need to be examined. The Project has provided an opportunity to discover the extent to which large urban school districts can be influenced, and whether different teacher training models can produce unique and even transportable results. As in the case of funding procedures, what can be learned is not limited to a narrow definition of "success." What the evaluation is seeking

to determine is not simply how well a particular aspect of the Project has succeeded, but what has been learned and how effectively it has been reported. In such a view, even "failures" that lead to the raising of significant questions are valuable.

Because this is so, the evaluators have chosen not to shrink from a critical examination of issues both large and small in regard to this Project. As will be evident, we feel PCS has fallen short of its expectations at a number of levels. Nonetheless, the attempts, if openly examined by either the evaluators or the PCS staff, constitute an important part of the learning that can evolve. The danger we have tried to avoid is that of excusing the Project's failure to add to our knowledge by pointing to the hardships it faced or by focusing upon the nobility of the effort. That would be unfair to both the effort made and the results intended. The Project accepted the serious responsibility of attempting to further inform the science education community on a number of important issues. The evaluators have attempted to give that charge the serious attention it deserves.

B. Instructional Methodology

How effective is the classroom instructional model the Project is seeking to see implemented? We believe the Project has not made a significant contribution in this regard. Little that would add to the depth of our understanding about the effectiveness of the "hands-on" approach, or that would improve our use of it, has been reported. It has not been the subject of serious research, or even extensive reflection by the staff. To a large extent, Project personnel seemed to begin and conclude their efforts with the assumption that such an approach was implicitly superior. Far too little was done to explore those assumptions in any detail or to offer supporting evidence.

One of the real problems with a "hands-on" approach is that students often bring to it a personal agenda that is non-lesson related. They come to the experience which has been prepared by the teacher with their own social and psychological needs. At least some of these will be directly contrary to the intent and the requirements of the learning that is being offered. Under such circumstances, the very structure of the "hands-on" approach can invite a conflict of purpose. Subtle responses and adjustments need to be made by teachers. The difficulties inherent in the approach must be candidly assessed, analyzed, and dealt with, not ignored. Too much of "hands-on" teaching is built upon an assumption that interest and the need to learn will so far outweigh other considerations that those other considerations do not really require serious attention. There is far too little evidence that this is so, and the entire approach needed to be explored rather than given an a priori acceptance.

It is generally acknowledged that this teaching method rests upon the intellectual curiosity or at least the interest of the student. What is not so easily seen is the great difficulty involved in instructing teachers in its use. It is hard to understand exactly how one is "trained" in such an approach. It has to be experienced, understood, even lived by the teacher before it can be passed on to anyone else. Personal acts of discovery are just that; if the teachers have not themselves experienced such acts with considerable frequency, they are ill-equipped to guide students in making them. This is as true for the university teacher as it is for the intern. Too often, trainees attain the vocabulary without having experienced the process either deeply or often enough. Worse, they are left unaware that this is so.

That PCS did not entirely overcome the dilemma posed by this instructional approach is attested to by the relative infrequency of its use. The evaluators did not observe a great deal of "hands-on" instruction anywhere, including the

university classrooms. Some eighty to ninety percent of what was observed at NYU was teacher lecture or group discussion. It was not common to see the teaching model so often spoken of actually practiced. The field experience was roughly similar with regard to the frequency of "hands-on" instruction observed. Observers in the schools, to a large extent, saw a practical reinforcement of the instructional model most frequently practiced at the university. The PCS staff itself lacked a master teacher who could demonstrate the model in sufficient variety and detail. Most of the instruction viewed was quite traditional in nature--an observation shared by the majority of visitors to either Project field sites or NYU classes. (See Appendices F-H.)

Perhaps if the approach had been more intensely examined and its possibilities more closely explored, greater use of it might have been seen. If the PCS staff had from the beginning treated "hands-on" as an hypothesis to be tested, more of importance could have been learned about the specific conditions under which it does or does not work.* By assuming that it was the best instructional intervention available, PCS has left the science education community with the same questions, the same lack of knowledge, and the same gaps in its understanding. Too little has been learned from five years of Project experience in this regard.

C. University-School Interrelationships

The schools serve a number of important purposes, and balancing them always presents a problem. The socialization function of the school vies with the educational, and often a real conflict is posed. Teachers, sometimes

*A number of science teachers in the schools in which PCS was located consistently reflected the view that as an instructional method, "hands-on" was more suitable for able students. Views such as that needed to be systematically examined, probably by the research arm of the Project. Unfortunately, they were not.

unconsciously, struggle to maintain what is in their view a reasonable balance. Students are increasingly peer group oriented, and place great premiums upon the need to be liked and accepted. Thus, the social aspects of school life compete with the academic for the student's time and energy. Some of the methods posed by teacher-training institutions inplicitly require a considerable increase in the degree of socializing allowed. Teachers resist this, and perhaps they should. There are some deep and vital questions here that need identification and discussion. The university too often moves directly to answers rather than explorations, neatly ignoring some of the real problems. The schools, which have to deal with consequences, can afford no such luxury. The larger educational community needs to face the fact that schools ignore the advice of university teachers and researchers not because they are ignorant, recalcitrant, or both, but because they do not believe the real issues are being addressed. That belief may not be as inaccurate as critics of the schools would prefer to think.

Part of the difficulty is that few formal mechanisms have been established that would facilitate a real exchange of ideas between the school and the university. PCS attempted to create such a link in the form of an on-site coordinator. This did not prove to be a completely satisfactory mechanism. The coordinators' professional standing did not seem strong enough for members of either institution to utilize them for such a purpose. That would have required more teaching and/or supervisory experience than most persons who filled that position possessed. Their status appeared to leave them ill-equipped to address institutional differences with authority, as several of the coordinators themselves pointed out.* A corresponding difficulty was posed by the fact that

*It appeared obvious to several of the coordinators that in their capacity as key implementers of change in the schools, they were often not taken seriously by either group.

three of the eight coordinators this year were employees of the public schools. Due to the nature of their responsibilities, the degree of interaction with PCS appeared extremely limited and little was done to use any of them effectively as a liaison between school and university.

In the absence of an effective mechanism, resistance to implementation efforts is likely to persist. The schools continue to offer opposition and those in the university continue to offer convenient rationalizations for the refusal of others to adopt their ideas. To accept their explanations would require the belief that the reasons for rejection are almost always unsound. That seems unlikely, and so deeper causes need to be sought. While teachers do not always take the time to offer a formal analysis, the constant refusal to adopt a particular approach should be viewed as something more than simple obstructionism on their part. There may be a basic flaw in what is being suggested: a real conflict between it and the environment into which its incorporation is being sought. The responsibility for discovering the conflict lies with the university; not the school. Since the university advocates the suggested change, the corresponding obligation of demonstrating the proof of that change's virtue remains theirs. It is an obligation which has not frequently been accepted--indeed one that often appears to have been studiously avoided. It is a simpler task to condemn the schools, attributing the lack of acceptance to their extreme conservatism rather than the university's refusal to give up such comfortable rationalizations and seek deeper, structural courses.

There are two conservatisms at work here, but only one is generally identified. The university has for too long been expert at identifying the resistance to change in other institutions while remaining blind to its own entrenched patterns. It remains too tolerant of behavior that is comfortably self-serving,

but has proven neither productive nor fruitful. PCS has been prey to this problem. The Project began with a heavy field emphasis. In the beginning, in-service workshops were conducted in the schools, and university faculty made frequent visits to field sites. Over the duration of the five-year funding period, however, one can chart an increasing withdrawal of the faculty to the confines of the university campus. This seems part of a larger pattern for such programs. The staff began with an emphasis upon working in the field but increasingly yielded to the temptation to return to an environment in which they felt most comfortable.* There is a pattern of gradual withdrawl from what was the central arena of intended activity. During the last year of this Project, there were increasing complaints about the non-availability of even the on-site coordinators in the schools. Thus one is witness to the retreat first of front line university faculty, followed by what would consitute second line staff.** The schools note such withdrawal with more than passing interest. That they draw appropriate conclusions about whether the university's ideas are workable in their environment cannot be doubted.

The universities, thus, have their own problems to overcome. They often employ a one-dimensional approach for dealing with the schools that is inconsistent with their expectations of a flexible response. While the problem referred to above requires resolution, the overall dilemma is far from unique to this Project. That it was not overcome is not surprising. It is not noted as a special flaw but as part of a constant and continuing limit to innovative efforts initiated at the university level. Those employed there need to take

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*The lack of power, authority, and status within the schools are probably important factors in the gradual reduction of the university presence. The capacity to influence always seems greater when viewed from afar.

**The coordinators were not considered faculty.

a broader and more embracing view of the university's own conservatism, its resistance mechanisms, and its hostility to modifying long ingrained practices. They need, in short, a far more sophisticated approach to attempts at cooperative interaction with other institutions than they currently possess.

The interfacing of institutions is a complex and demanding process requiring an understanding of institutional behaviors, and the development of distinct strategies or approaches. The NSF would be well advised to require a demonstration of such an understanding (and a well designed plan to put it into effect) from any outside institution seeking funds to implement programs in the schools. This Project made reference to an institutional change model in its proposal, but never appeared to take it seriously enough to formally plan and apply it. Even then, the model was too "other-institution" oriented, reflecting an ethnocentrism that was ill-equipped to deal with the full set of problems inherent in such inter-institutional arrangements. For the scope of what was being considered, PCS took too little account of the type of resistances they were bound to encounter. Even less thought was given to those to which they themselves might prove susceptible. The result was that the implementation effort was at best uneven, frequently uninformed.

D. Effecting Change

The Project had, as part of its design, the calculated use of key individuals who were to serve as agents of change in the schools. PCS had assigned this role in different ways to both its on-site coordinators (OSC's) and its interns. The strategy seemed to be to work at changing conditions in the schools by skillfully employing the talents of individuals filling those two roles. The OSC's, being professionally more experienced, were generally charged with greater responsibility in this regard.

Based on observation and interview data, a reconsideration of who would serve best as the agents of change is suggested. The evaluators would urge that the PCS staff contemplate training school personnel to fill this role. In particular, we would suggest working with administrators at the building level, and science coordinators (or other key personnel) from the central office. There is a need to interact with these individuals and discuss questions of deeper educational significance. By their own admission, school administrators have all too little opportunity to do this. They need to be invited in as joint partners: co-planners of key Project efforts. They need to be consulted about direction and used in a way which would help them see themselves as conscious agents of change, with a particular purpose and an accompanying plan in which they have confidence. This will require developing a strategy with them, and clearly defining their role. Including them in such planning would not only employ their talent and experience, but would provide the opportunity to inform and direct the key implementers of such a strategy. This would appear a more promising approach than that which has been attempted.

The training task is not an easy one and needs to be carefully considered. The resulting application would be far more direct, however, Further, if it proves workable, the potential dividends are much greater. One can make a real beginning at the development of model schools through such an approach. These administrators have a large say in employing staff and often set the standards for the school. Their normal institutional role allows them to hire teachers,* thus using their position to improve the quality of the staff and change the tenor of the school.

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*This includes interns graduating from the PCS program who could presumably provide the foundation upon which revitalization would be built. As noted in an earlier evaluation (Appendix B), the Project failed to give much attention to seeing that their graduates were so employed.

PCS appeared to believe that they could minister directly to what they felt was a small, well defined population: the junior high school science teachers. In retrospect, it does not appear that this was ever possible--at least not in the way that was assumed. These teachers are part of the total system. They work within it not outside of it, and cannot be separately influenced in the manner attempted. The whole system impinges on their day to day activity, exacting from teachers a behavior which conforms to the structural demands of the school. In some ways the Project staff seemed to know this, but in important ways they did not act upon it. It was a fault in the design that was never fully compensated for. The staff needed a better vehicle for making a fuller impact upon the whole system. PCS could have considered how to affect administrators and other teachers in order to influence science instruction. They chose the reverse route: attempting to influence the system through its science teachers. In such competition to influence teacher behavior, the university was badly overmatched. It would appear that attempting to use the natural structure of the system would have been a wiser course. It is possible that middle management, i.e., building administrators and subject area coordinators, are the most influential components in a large city bureaucracy. Their tenure is often more permanent than that of either the teachers below them or those at the superintendent level and higher. They are clearly more accesible, and more time can be spent with them.* They have the capacity to more directly influence actual classroom instructional practices. That they were not worked with more closely seems to have been a major error. They appear to have far more influence as potential change agents with both subordinates

*Teachers, particularly in large, urban, unionized school systems, tend to leave immediately following the last period and are rarely available during the day. Superintendents are generally far too busy to give the problem of classroom instruction the attention it requires.

and super-ordinates than those the Project chose to use in this capacity.

Whether the PCS staff decides to use the administrators in the manner suggested or not, they must increase their interaction with them. The full burden of responsibility to effect change cannot be left to interns and co-ordinators. These latter are potential instruments which the Project staff and school administration might employ only to help implement decisions which have been jointly reached. They can serve an important purpose for the Project if used this way. If the original role planned for coordinators had any chance to work, it was dependent upon PCS employing exceptional individuals in that capacity: master teachers whose demonstrated example was so strong it could compel others to reexamine their approaches. The Project did not fill these positions with such individuals.* That failure vitiated whatever likelihood of success that might have existed. To a large extent, the Project operated on the one hand at too high a level for meaningful change and on the other at too mundane a level to be effective. Somehow middle management personnel were too little consulted or influenced, and on a day-to-day basis they are the ones who run the school system.

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*While the staff was able, they could not be described as master teachers, at least not within the realm in which the Project was working.

IV. GENERAL CONCLUSIONS

A. Vision

PCS represents an important and necessary attempt on the part of NSF to support innovative educational efforts. Aside from the strengths or weaknesses of this particular Project, the effort that has been made is important. Educators have recognized that the junior high school has been too long ignored. Many agree that it often represents a pivotal point in the life of students: a time in which vital decisions about their educational futures are being made. For all that educators acknowledge the importance of junior high schools, little of practical significance has been done to address or attempt to alleviate the problems so freely alluded to.

Project City Science represents an attempt to deal directly with one of the problems. The original concept was sound and the Project's authors did not avoid the real issues. They chose to work in the schools, dealing directly with students and teachers, thus exposing the Project to the risk of failure, in exchange for placing themselves in a position where they could make an impact. The risk was compounded since PCS chose to work not only at the junior high school level but within an inner city urban setting that was experiencing declining economic conditions, increasing population shifts, and great problems with teacher morale.

The initial design for dealing with these problems was audacious in its vision. There were some drawbacks to that as will be noted in the next section; a conception so elevated eventually needs to be translated into concrete action, and that can prove a stumbling block. Nonetheless, in the initial stages, a grand vision of what can be accomplished needed to be offered. Such a vision was provided. The design offered was prescient, anticipating interests, and pointing to an important policy direction. What was proposed was

bold and imaginative. It pinpointed an area of need, and identified the separate resources which could be formed into an alliance to meet that need. The implementation of such a design was a separate matter, requiring a different set of skills. Translating theory into practice offers few guarantees. The experience of Project City Science has demonstrated again the difficulty of attaining objectives that are ambitious in scope and require major institutional adjustments to accommodate them. The Project was far less successful in meeting such objectives, and some of that can be tied to the very breadth of what was envisioned in the original plan.

B. Scope

The evaluators believe that an excessively optimistic set of expectations was entertained by the Project staff. This was also alluded to by the evaluators of Phase I of their effort.* A program that is overly ambitious in its intent-ambitious to the point of being unrealistic can end up in a state of organizational confusion. It can result in subverting project planning by creating a level of illusion that confuses program functioning, leaving the staff without clear direction. In such situations a dichotomy is often introduced between statements of intended purpose (which the staff begins to conceive of as ideals rather than guides) and actual behavior. The result is that statements of purpose and actual behavior become increasingly unrelated.

Such a separation between thought and action appears to have been an unintended outcome of this Project. Based on observer and interview data, the connection between expressed Project purposes and actual outcomes was consistently weak. The ambitious scope of the proposed research effort, the design

*The evaluation was conducted by the Center for Instruction, Research and Curriculum Evaluation (CIRCE). See PCS Progress Report 4.

for institutionalizing change, and the attempt to create model districts were examples of goals set so high that actual performance was left without realistic guidance. This resulted in key Project activities often seeming random rather than purposeful, and discontinuous rather than aggregate in nature. In our view the "Progress Reports," while useful, reflect that discontinuity and lack of long-range focus.

Despite the ambitious nature of its goals, the Project remained somewhat insular in its actual operation. Far too little outside help was sought. The Project's failure to make use of the New York University community is noted in Appendix B. With the exception of a portion of a single sociology course (dropped in the final year), only PCS staff were involved in the actual instruction of interns. We believe a number of outside consultants or guests could and should have been used. As one of the interns noted, "It would have been good if they had brought in a Black or Hispanic psychologist who could have given us a little better insight about the kids and their problems." There were a number of such special circumstances where outside expertise could have proven invaluable, and not all of it need have been financially prohibitive. Resources from the Board of Education and a variety of New York City institutions, including other universities, could have been obtained free or at nominal cost. There were, and are, a number of minority coalitions, alternative schools and public service organizations willing to offer services or provide useful experiences.

A similar problem was the Project's lack of a broader vision of its purpose. It retained a narrow view, often seeing its role in specific New York City terms, and never really addressing the larger issues of inner-city instruction in science. Attempts to put staff or students in contact with science educators working in similar circumstances were far too infrequent. Drawing

upon the experience of programs in neighboring cities was seldom attempted, yet the evaluation staff found there were individuals who were both knowledgeable and interested in sharing concerns.

Failure to seek these interconnections may have been an oversight, but it deprived the Project and its interns of views that could have been at once broadening and informative. It also served to deny the Project staff access to the potential dissemination outlets they were seeking. There seemed to be too limited a sense of responsibility to the wider audience of science educators. Operational aspects of the Project were conducted as if they represented mainly a local effort, with little being tested, developed, or offered in a form that would stand rigorous review. A better sense of their relationship to the broader science community might have encouraged a more effective use of available resources, and a wider scope for Project operation.

C. Status

If one is to be guided by recent "Progress Reports," the Project appears to consider that important elements which are transferable have been completed.[25] The evaluators do not concur. The Project is, from our perspective, mainly a source of potential that has not yet been fully realized. The extent to which it will be remains unclear. Viewed in a favorable light, one may consider that the Project is right on schedule. At the end of five years, they remain a viable force that is in a position to accomplish something. They are, in this view, an unfulfilled but possible source of good in the area of science education. Perhaps more could not have been expected than that the Project staff would have brought themselves into such a position by this time, although their own hopes were surely greater than that.

Regarding the Project's present status, the evaluators want to emphasize

their view that PCS is not what it appears to be on paper. An extensive attempt to document that discrepancy is offered in an earlier report (Appendix A). The Project's reports, continually assessing its own endeavors, are, in the opinion of the evaluators, inflated in their optimism about both what has been accomplished and what remains within reach.

Projects such as this develop a certain isolation from the immediate world in which they live. There is a tendency to receive only data that reinforces a positive view of what is being accomplished. Some of this is natural. The work is hard, and positive reinforcements are few. It is not a strength, however, and needs to be resisted. It was not unusual to find that the Project staff discounted viewpoints from sources they considered either biased or unimportant. The concomitant phenomenon was that they were not profiting from what those sources had to say.* The Project was not well served by such attitudes.

While the staff personally accepted criticism of their efforts with reasonable grace, there was not always a calculated effort on the part of the Project as an organization to obtain an unbiased assessment of how others viewed the quality of their work. A weekly hour with interns, presumably created to obtain feedback, was not well used in this regard. The Project staff dominated the time with administrative and program details. The hour was eventually supplanted by a course in the second semester. In the meantime, interns complained that their concerns were not heard. Considering the extent of the need for input, this seemingly casual dismissal of a valuable source of data

*The attitude was manifested in the Project staff's reaction to the view of some of the school personnel, as well as to their own interns. It is perhaps exemplified in the response to the CIRCE report, an assessment of Project's progress which the evaluators believe was informed and accurate in its identification of prospective problems.

was a mistake and should be rectified. Similarly, the Project's research staff was not frequently providing needed information about its operational aspects. In many ways, the Project did not have an external, unbiased insight into how it was functioning.

In the absence of either openness or access to such external data, the Project has clung to a grander vision of its efforts than has been warranted. This, in combination with an insufficiently restrained rhetoric, characteristic of the Project from its inception, served to blur meaning, obscure purpose, and cloud actual activities. It too often hid what the Project was truly accomplishing, perhaps because it was less than that which was intended or desired.* The earliest evaluation report said as much, though sometimes in unappealing language. Its counsel appeard to be ignored, and the Project staff continued to believe they could accomplish the grander goals--the larger vision of their purpose. Those earlier evaluators concluded, and the present ones agree, that this was never possible, although a number of smaller but still important things were.

D. Planning

In actual operation, the Project was guided by the original proposal design. We have noted that the design was imaginative, and addressed itself to real and important issues. It was not without defects, however, and some of these caused the Project difficulty. A concern has been expressed about the scope and the depth of the impact anticipated in the original design.

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* In this, the "Progress Reports" were an unfortunate accomplice. The staff was required to issue them at three (later four) month intervals. It is difficult in such a short space to find exciting activities to report, and one is encouraged to use inflated language or begin dwelling upon future promises. The Project staff fell prey to both errors.

There were other difficulties. The proposal called for the deliberate use of a number of staff who had no experience with the New York City schools. There was also planned turnover of certain staff members at predetermined intervals. The rationale offered was not entirely convincing* and, in the view of the evaluators, the concept did not work well. The lack of familiarity with the mechanics of the New York City schools represented an obstacle to a number of the coordinators that was not well compensated for by the broader view of events which their inexperience presumably allowed. Indeed, some became effective only as they grew more familiar with the way the schools worked. This build-up of experience was often lost to PCS when, either through personal choice or by predetermined plan, such staff left the Project. Thus, the weaknesses of these positions showed up far more than did their assumed strengths.

Another operational difficulty the Project faced was the problem of planning changes in its own procedures to meet the new challenges that arose. Even a project that begins with the intention of remaining flexible has a tendency to fall into an operational mold. What this Project has demonstrated to the evaluators is the intense need to have organization planning and objectives clearly developed prior to program operation. Once the program begins, a major impediment is finding the time to identify, discuss, and plan necessary changes. Events begin to acquire a momentum of their own, and staff are often in the position of reacting to, rather than directing them.

If proper preparation is to be made, it is likely to be accomplished in one of two ways. The most likely of these is through the careful and thorough

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* The use of staff without New York experience was an attempt to avoid a conformity to the views of the city system that does indeed exist. The planned turnover represented an attempt to view the coordinator's position as a vehicle for training future college instructors.

organization of the program in advance. This includes making provision for the staff to meet at prescribed intervals to assess, in detail, program progress. A second method is that of halting program activity while planning a new direction--a course of action that seems justifiable only in extreme emergencies such as PCS faced. If finding the necessary time to plan changes in direction is as difficult as has been perceived, then a great premium is to be placed upon developing a thorough operation design at the outset.

Important elements of Project City Science were not fully in place at the initiation of program activity. Some of this was planned. This was particularly true of faculty roles, which were not carefully described but were expected to evolve with experience. It was also true of the planning for model districts, which lacked detail in regard to key roles or how major objectives would be attained. The research phase was similarly open-ended, not clearly identifying roles or assigning responsibilities. When the operational need for job descriptions that would avoid overlapping efforts arose, there were too many demands upon the staff to allow systematic planning. Weekly faculty meetings had to deal with many pressing issues and generated their own dynamics. In any event, they would have provided an inadequate forum for the extensive analysis that needed to be conducted.

In the absence of a formal structure to which one could resort for definition of roles and functions, PCS evolved an increasingly informal operational style. This had its strengths in that it allowed the staff freedom and flexibility. It also had notable weaknesses: The staff was neither thorough nor systematic in their efforts. A clear line of research was not identified until late in the Project's existence, though a number of interesting speculations had been offered earlier. The implementation of changes in the schools was not pursued in an orderly and precise manner. There were not consistent

attempts at raising questions or closely defining concerns. The Project lacked an operational persistence, a clear definition of its major tasks, and an unyielding determination to pursue them in a manner that would identify important issues, raise substantive questions, or produce information of consequence to the field. Even the production of monographs portraying a host of school-related activities, or journal articles pointing research directions or identifying concerns, would have represented significant contributions. Such outcomes, unfortunately, did not result.

On a different level, several consultants recommended that the Project employ a number of master teachers who could translate what was being suggested into classroom instructional practices. This appears to have been a sound suggestion. The lack of availability of such personnel hampered the Project, and was noted by a number of interns and some cooperating teachers. Such practical demonstrations of successful techniques would have constituted a potent means of changing teacher attitudes and initiating the development of model schools. As one educational critic has suggested:

> There can be no significant innovation in education that does not have at its center the attitude of teachers and it is an illusion to think otherwise.[26]

The existence of the master teacher would have been a great aid in allowing the Project to translate its purposes into concrete, observable actions.

PSC also needed to address the organizational issue of developing effective intra-staff working relationships. There was an operational gap between clinical and research oriented elements of the staff. Such differences are to be expected, and can even be productive, but they must be dealt with skillfully. They appear to have gone unattended, perhaps unrecognized, for too long in this Project. Neither group clearly saw the other as a powerful source of aid in accomplishing some of their key purposes. Because of the nature of Project

activities and the position of the clinicians, that group attained an ascendency in practical decision-making, which weakened whatever research effort may have been possible.* Here, then, was a program attempting to bridge the gap between universities and schools--which is wide, traditional, and multi-faceted--which had not completely resolved subtle divisions within its own faculty. The result was that the staff was left to implement its ideas without a viable assessment of their impact or value.

The rift experienced by the staff was a miniature version of the practitioner-researcher split that has long plagued a number of professions. Anything the Project was attempting to accomplish would have to overcome not only such divisions within its own staff, but the resistance of teachers in the field as well. Because such opposition is so formidable, few innovative ideas, including this one, find their way into actual classrooms intact.

> Assuming that an invention is born, it must then find its way into the social network of the practitioner. The isolation of the research community from practitioners in education is legend. Geographic distances, status differentials (as between researchers and practitioners), legal boundaries, and a dozen other barriers inhibit its journey. Most innovations never make it so far. Those that do, like individually prescribed instruction, are transformed in the process. The final metamorphosis is performed by the practitioner, who blends the invention with other messages and shapes them to his own ends, which are certain to be removed from the vision pursued by the inventor.[27]

PSC was not particularly effective as an organization in dealing with this common but persistent problem in education. Too much of what was attempted yielded to, rather than overcame, this dilemma.

E. Legacy

On an individual basis, the Project has attained a measure of success. It

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*A lack of direction on the part of the research staff was likely an important contributing factor in the weak performance.

has survived under extremely difficult circumstances, and may eventually obtain some local funding support.* That would be a good first step toward the ten years of non-federally supported activity originally contemplated. Viewed from a wider perspective, PCS has not thus far provided a great deal that can be passed on. The legacy of the Project in terms of particular outcomes is not strong. Its disappearance would represent more a loss of potential than anything the science education community or even the New York City schools would immediately miss. They remain an unprove quantity--an as yet unrealized potential. Their significant contribution, if any, remains in the future--not in the past or present.

Some things have been accomplished. A number of interns have been trained and are working in urban junior high schools.** The Project's publications are appreciated and seem to have been well received by some of those to whom they have been sent. Most important, the PCS staff has developed a working relationship with a number of schools, and put themselves in a position to offer effective help. Personnel in the schools report that a relationship with the University is important to them. It challenges complacency, exposes the staff to new ideas, and invites reexamination of current practices. As such, it represents an association that has inherent value to the schools. PSC has filled this need.

One must balance these accomplishments with efforts that remain incomplete. The model districts are a long way from being formed and the dissemination

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* The most recent information is that the PCS staff has been unable to obtain outside funding for the initial years of its proposed Phase III effort.

** Project records in regard to employment of interns are imprecise. It would appear that some 25-30 of the program's 1975-1978 graduates are currently employed as teachers with as few as 10 working in urban junior high schools.

effort has not yet resulted in the Project's being duplicated elsewhere. While the research staff has made presentations at several conferences, there has not been an article published in the five years of Project activity, nor is there any prospect that the Research Institute will be formed. While the Pre-service Program remains the most fully developed of the Project's efforts, it also poses a number of unanswered questions, particularly in regard to its power to attract a sufficient number of students.

What the Project has done well is to establish communication with a number of disparate forces in New York that have an interest in education. The staff has developed good relationships with members of the teachers' union, educational administration, and several school-related institutions. Through the effective use of an Advisory Board, they also have access to a varied and highly skilled pool of professional talent. This is no small accomplishment. In achieving these things, the Project staff may have placed themselves in a position where they can be an effective spokesperson for science education in New York City. If Project personnel can scale down their ambitions and organize themselves to do better what they are realistically capable of accomplishing, they could make a real contribution. Theirs is a voice that can be helpful. What they have attempted is important and can be a constructive aid. To the extent that Project staff can focus their efforts on clear objectives and capitalize upon the influence they have gained, they surely have much to offer.

In saying this we in no way mean to imply that the Project staff has been successful in attaining their original aims, for we do not believe they have been. Nor do we claim they have attained their global objective,

for clearly they have not. They are a small project doing some interesting things, a number of which are commonly done by other departments of science education. There is one notable exception. PCS has made political contacts and alliances within the New York City educational bureaucracy that are impressive, and unlike those which most comparable departments manage to achieve. They have laid the groundwork to become a useful and constructive force for science education in New York. In pointing this out, we do not suggest the Project is what its written documents imply. It is not. We do note that when the overstated claims that often obscure what the Project is doing have been scaled down, they have the potential to do some interesting and useful things. A foundation has been laid and some good may result. The direction is not yet clear and the plan not fully formed, but if the staff uses what has been established in an imaginative and intelligent fashion, some of what was intended may yet result. Their considerable skill in establishing and effectively maintaining a network of communication with important elements of the educational bureaucracy can be used to help science instruction in the City. That much has been accomplished by the funding. It is up to the funding agency to determine whether or not that is enough.

F. Report Format

As has been indicated, the Project has four major operational aspects: the Preservice, Model Districts, Dissemination, and Research programs* In the sections that follow, some of the major recommendations that were offered in the final report for each of the four Project components are given. Each recommendation is followed by one or two paragraphs of explanatory comment.

*For a fuller review of the documentation explaining Project purpose, see Appendix A of the full report.

Following the program recommendations are a list of policy recommendations which are offered to the NSF for their consideration and appraisal. Both the full evaluation and the recommendations which resulted from it were based upon data more fully reported in a separate set of appendices which include two earlier evaluations of the Project. Readers with deeper interest and greater endurance are referred to the full report.

V. RECOMMENDATIONS

In this section two types of recommendations are offered. The first is concerned with particular aspects of Project City Science and is intended mainly for Project staff. These recommendations are separated and listed under the four program components to which they are related. (Items A-D) The second set of recommendations is broader, involving policy matters, and is offered to the National Science Foundation for their consideration. All recommendations are followed by brief paragraphs in which an explanation of their intent and meaning is offered. For a fuller discussion of these recommendations, the reader is referred to the full report.

A. Recommendations for the Pre-Service Program

1. The Project needs to examine the specific skills of its own staff and optimize their use.

A key to the success of any Project of this type lies in the proper use of staff skills. It is clear, for example, that not all staff members functioned equally well in a teaching situation though they may have had compensating strengths which could be well used in other areas. The Project's staffing was weak at several key points in that staff skills did not match up well with the set of responsibilities and tasks that needed to be performed.

2. The Project must develop better means of obtaining information from their preservice interns.

In the past two years, a variety of highly useful information has been collected by the evaluators from on-site coordinators and preservice interns. The same type of information could have been gathered by the Project staff and used to shape their professional efforts. The Project had the services of the research staff and a better effort could have been made to not simply test the interns but to also seek their inputs in a formal and consistent fashion over the course of a school year. A similar problem existed in regard to following up program graduates. Far too little was attempted and an invaluable source of information about the Project. was lost.

3. The university must learn to separate Project business from the business of the department.

The Project is a full-time venture. The University's continued demands upon the department helped deplete the Project staff's time and absorb their energy. Because of financial arrangements within the University, the science education department and the Project frequently shared the time of staff members. It was not always clear that this "sharing" sufficiently freed faculty from former responsibilities.

4. The Project needs to draw upon a broader base for its instructional efforts.

If the Project wants to teach in an interdisciplinary manner, it must function in an interdisciplinary mode, building appropriate contacts within the University. Almost the entire teaching load was borne by graduate students, adjuncts, and Associate Research Scientists. Essentially, three people taught twenty-one of the twenty-four credits in the program - science content, educational methodology, curriculum and field supervision. The Project staff simply seemed to be trying to do too much by themselves. Involvement by other departments could provide new perspective, different expertise and perhaps a new insight into persistent problems.

5. The Project needs to direct its efforts to the specific curriculum of New York City.

The Project was not designed to write curriculum and yet the pre-service interns were frequently involved in designing hands-on units of activities that were not specifically related to the New York City curriculum. Like it or not, the teachers in the City's junior high schools are committed to a specific curriculum. The Project needs to do a better job of teaching its trainees how to apply its instructional methodology to a given curriculum.

B. Recommendations for the Model District Program

1. The Project should attempt to make better use of personnel within the New York City School Districts.

The New York City school system is staffed by some capable, highly sophisticated people. The system has, as one would expect, an inertia and a certain penchant for maintainance of procedures to which it has grown accustomed. These drawbacks, however, are not by any means the sum total of what the system has to offer. If only the impediments are seen, then the sole approach conceived of will be how to minimize the blockages they represent. That would lead to a strategy of avoidance, i.e. the less contact with certain forces the greater the likelihood that Project efforts would be impeded. We believe that something like that occured with PCS and it circumscribed progress.

2. The Project staff should state more clearly the changes they are seeking to bring about.

Any attempt to introduce a change into schools means one must deal with some existing behavioral or programmatic regularities. The project should be capable of stating those regularities that exist and noting the changes which it intends to bring about in them.

3. The Project should strive to meet the original goals of the Model District Program.

To accomplish this recommendation, these goals must generate an appropriately implemented program. Appropriate implementation is not ideal implementation but rather enactment to the point where the essential elements of the original innovation are left intact.

4. The Project should conduct its workshops in the school districts.

This was a common suggestion for improving the competence of the cooperating teachers. The Project has done this in the past but gradually the workshops appear to have been relocated at the University. Such a tendency is not unexpected but would appear to defeat the purpose of the workshops by making them less available, in practical terms, to teachers.

C. Recommendations for the Dissemination Program

1. The dissemination effort must move to the level of describing research and offering data about the results of its training model.

To be an effective long range spokesman for science education in urban centers, PCS must design a dissemination plan that goes well beyond sharing information which only describes activities and goals. Up to this time much of the dissemination phase has dealt with recruitment of students, publicity to districts, and program information to other cities and institutions of higher education. After five years the Project should begin to show results, negative or positive, so that other innovative science education efforts can replicate the PCS model. A serious lack of reporting mechanisms and an absence of feedback data on PCS drop-outs, program graduates, and its experimental schools, hindered the dissemination of the model to other areas of the City.

2. The Project staff need to reconsider and clarify their choice of an educational change model.

Project personnel need to more precisely determine what concept of educational change they believe in and want to use for the remainder of the Project's existence. It is also recommended that PCS consult with outside change specialists with the intent of setting clear directions for future dissemination activites. The sine qua non for effective dissemination is effective Project implementation. That requires a carefully conceptualized model for changing teacher and student attitudes in these experimental schools.

3. Dissemination must be made in format that insures fidelity to the PCS model.

The PCS struggle to maintain the Project and to establish new funding sources may increase the danger that there will be further loss of Project identity. Anyprecipitous or dramatic changes in the form and substance of the Project could leave only a skeleton of what was intended or accomplished.

If the Project staff truly feels that it has a solid preservice model, and that they can shape model districts or initiate valuable field studies, then they must not stray too far from the original approach. If the staff manipulates and recasts the role of on-site coordinators by selecting them in ways that fit individual school districts but not those of the Project, PCS may end up with just another student teacher program.

4. The Project should attempt to define its intended audience more clearly.

The PCS staff must consider whether or not the evidence of implementation results over five years supports the assumption that the Project has equally positive advantages for all urban junior high schools. This recommendation is intended to suggest that a definite limitation of the audience targeted for PCS dissemination be considered.

D. Recommendations for the Research Program

1. A broader coalition of those with related inerests in research should be sought.

The research expertise of other educational programs such as educational sociology, educational psychology, and the resident bureaus such as the Office of Institutional Research could have been more intimately involved in the planning of research and evaluation projects. The sense of the effort conducted is that the small cadre of professionals in the Project who were seriously pursuing ideas felt somewhat alone in their pursuit of relevant research and evaluation projects which would have measurably contributed to the Project's success. It is urged that greater efforts be made to interest outside groups and demonstrate the opportunities that PCS presents to them.

2. Professional help from outside the Project could have been fruitfully used.

This Project did not lack researchable areas. It suffered primarily from being unable to translate these topics into research and evaluation design. At

a relatively small cost to the project, knowledgeable persons in science education research could have been consulted with Project personnel on a regular basis. That remains possible. The skill the staff must demonstrate is that of attracting sufficient interest in its efforts. Some of that can be accomplished through the conduct of research that draws attention to the unique opportunities such a Project provides. Other interest can be attracted through dissemination efforts.

3. More attention should have been paid to examining the relationship of the research conducted to the primary needs and interests of the Project.

The fact that the studies and analysis do not neatly fit into "science education" does not make them without merit. The efforts may ultimately be a contribution to the overall attempt to understand variables which affect the learning of junior high school students. The studies, however, have not maximally informed the Project about how well they are doing nor how they could improve their efforts. Few of the studies completed can be regarded as providing information to the Project staff regarding the success of their teaching, curriculum development, administration, recruitment, placement, and community liaison activities.

4. The planning for the funding, staffing and activities of the Research Institute should have proceeded concurrently with all other Project activities.

If this institute was as important as it appeared to be in the original proposals, it should have received far more attention than it did during the five year term of the Project. Perhaps the original conception of an Institute was much too extensive for what could be accomplished in this Project. Based on Project documents, it was conceived to be an autonomous center ultimately separated from the Project, supported independently, and evolving from five years of experience in research and evaluation of science education. It now seems evident even to the Project staff that such a goal was extremely optimistic. An Institute with capabilities for dissemination of knowledge and conduct of basic research with a national scope has not been developed. Of perhaps equal

signigicance, planning for the Project's Phase III continuation does not appear to include a serious effort in the area of research and evaluation.

E. Policy Recommendations

1. The NSF should reconsider and clarify its policy regarding Project reports on progress.

The quarterly (revised to trimester) reports required of the Project appeared excessive. They drained staff resources and their very frequency precluded the long term reflection that would have made them useful. The evaluators suggest that an annual or bi-annual report would serve the intended purpose. Additionally, reporting which simply records in a general way, the various activities in which a project engages, should be discouraged. Reports should instead be viewed as the means for formally reporting the specific results of project activity. Interested educators might thus be encouraged to consult such reports for data on successful classroom implementation, teacher training practices or current research.

2. The NSF should attempt to insure that program revisions are reasonably proportionate to budget reductions when cutbacks take place.

When there is a drastic revision in the level of funding offered a project, care should be exercised to assure that appropriate adjustments have been made in the scope of what is being attempted. The development of such a policy seems particularly necessary when large scale funding is being considered but would apply equally to any circumstance in which extensive reductions of budget are involved. Developing proposals is a difficult process and accepting cuts a disappointment. Those involved are unlikely to make even necessary revisions at such a time, unless encouraged. As we have indicated elsewhere, once projects become operational there may no longer be time to properly plan such revisions.

3. The NSF should assure deeper levels of commitment and support for staff involvement from university officials.

The support anticipated from the wider university community should be specified in projects such as PCS. Too often, university officials see no commitment beyond that of the particular staff for whom the funds are provided. Broader support is needed, and should be expected, if the university truly believes in the program that its staff has developed. It should not be considered normal for such programs to cease when funding is concluded.

4. A greater effort should be made to insure that projects requiring school-university cooperation are not dominated by the needs and perspective of the university.

The schools should be brought into a full and realistic partnership, one in which they actively support the major purposes of the program. The schools must view themselves as co-sponsors, not as passive onlookers offering their facilities in exchange for some additional help over which they have little control and limited interest. The latter has been the more common "partnership" that colleges have established with the schools. A truly joint effort would require that the university relinquish some of its power. Such a partnership would mean that the university staff would actually invite the schools to examine the ideas they are seeking to implement, with the right to accept, modify or reject them. Where differences of opinion on any aspect of the program occur, true partners would have to find means of resolving them. The university should no longer have the luxury of presenting a fully developed program on a "take it or leave it" basis, where the schools must accept the arrangement proposed virtually intact, or risk losing what to them are necessary and helpful additional services.

Moreover, steps should be taken which encourage designs that insure the direct involvement of university staff in the schools. Too much emphasis has

been placed on models in which the practices advocated by the university are demonstrated by modestly trained, or inexperienced intermediaries. Continuing to support such approaches allows the ideas to remain virtually untested, for it is unlikely that novice instructors can demonstrate them adequately. If university staff believe their approaches can revitalize instruction, they must accept the challenge of using more direct means of demonstrating them.

5. Care should be exercised when a project requires numerous additions to the regular staff in order to meet program objectives.

As was suggested earlier, the evaluators believe that considerable risks are involved when key staff positions must be filled by individuals whose capacities to perform the function are unknown. The larger the number of such unfilled positions, the greater is the risk involved.

6. For evaluations to be fully useful to project personnel, they should be initiated early in the project's existence.

The present evaluation did not produce a report for the PCS staff to consider until the end of the Project's second year of refunding (and fourth year of existence). That was too late to be of practical use. By then the project had settled into an operational pattern that was difficult to break, even when the staff agreed with the criticisms raised.

7. The NSF should fund an effort to identify successful ongoing programs of science education.

Success model identification and the support of studies seeking to determine their cause would appear to be a good investment. While we question the extent to which any program is transportable apart from the personnel involved, much can be learned which is instructive and some elements can be adapted for use in other programs.

In a similar vein, we advocate the support of quick and inexpensive evaluations of projects such as that conducted by CIRCE for Project City Science.

They have their uses and while their brevity will generally not allow the collection of a broad range of data, the value of such studies should not be underestimated. Beneath the mountains of data that sometimes obscure rather than clarify, the views of skilled and perceptive observers can often provide the most meaningful insights available.

8. Projects should be encouraged to have their major elements planned and in place before program operation begins.

The evaluators have been struck by the capacity of events to outstrip planning and organization. The problem is widespread, affecting governmental as well as other institutions. In this project, a momentum was developed by the daily operation of the program that made its own demands and left very little time for reflection. It is clear that if projects such as this one are to exercise some control over events and not be dominated by them, key organizational and staffing elements will need to have been carefully considered prior to the initiation of program activities.

FOOTNOTES

1. National Science Roundation, RFP # 77-131, request for an evaluation of Project City Science, pp. 1-2.

2. Buccino, Alphonse, "Recommendations on the Future of Systems Experiments," NSF position paper, Sept. 1974, pp.3-6.

3. New York University, Department of Science Education, Project City Science (Funded by the National Science Foundation), Quarterly Report #4, p.31.

4. New York University, Department of Science Education, Project City Science; Revised Proposal; submitted to The National Science Foundation, January, 1976, p.2 This proposal was a modification of the second proposal and will be referred to as the Revised Proposal.

5. "Science for Urban Junior Highs," Mosaic. vol. 5. #8, Oct.-Sept., 1977, p.33.

6. New York University, Revised Proposal, op. cit., p.3.

7. Ibid.

8. Ibid., p.1.

9. New York University, Department of Science Education, The Continuation of Project City Science: A Cooperative Multi-functional approach to the Improvement of Intermediate School Science Teaching in the Inner City, proposal submitted to the National Science Foundation seeking refunding for Phase II (1976-79) of Project City Science, December, 1975, p.1. This proposal is referred to in the text and subsequent footnotes as the second proposal.

10. Ibid., p.7.

11. Ibid.

12. Ibid.

13. Ibid., p.8.

14. Mosaic, op.cit., pp.31,33.

15. New York University, Revised Proposal, op. cit., p.1.

16. Ibid., p. 1-2.

17. Ibid., p.2.

18. New York University, Second Proposal, op. cit., pp. 9-10.

19. New York University, Project City Science, Progress Report 11, p. 41.

20. New York University, Department of Science Education, New York University Preservice Program for Intermediate School Science Teaching, competency based teacher education document mandated by the New York State Department of Education, submitted January, 1977, p.8.

21. Mosaic, op.cit., p. 31.

22. New York University, Revised Proposal, op. cit., p.3.

23. Sayers, Barbara, "Changing Science Instruction: Project City Science", NSTA News-Bulletin, May 1978, p.9.

24. New York University, Revised proposal, op.cit., p.4.

25. New York University, Project City Science, Progress Report 4, p.11.

26. Weingartner, Charles and Postman, Neil, Teaching As A Subversive Activity, Delacorte Press, New York, 1969, p.33.

27. House, Ernest, The Politics of Educational Innovations, McCutchen Publishing Corporation, 1974, Berkley California, p. 176.